

we find an excess of cloud and rain on the equatorial sides of the respective localities where droughts occur.

The Annual Report for 1901 of the Meteorological Commission of Cape Colony shows that in general, over South Africa, the rainfall of 1901 was normal or above, the excess being decidedly large in September and October. Did this excess continue over into the spring of 1902 when the watershed of the Nile had a deficiency? The deficits of 1901 and 1902 in England and Russia were accompanied by excess in parts of the Mediterranean basin.

It may be anticipated that, in general, the areas of excess of rainfall that accompany and really result from the conditions that cause a given area of deficiency will develop at irregular times and places depending on favorable local circumstances, although, in general, subsequent to and on the equatorial sides of the droughty regions.

Thus an unusual movement of ice northward into the south Indian Ocean, due to an unusual southerly component of the wind in that region brings excess of rain to South Africa. But this unusual southerly component over the Indian Ocean, or this outflow from the Antarctic, must be accompanied by either a corresponding northerly component in some higher stratum above this region, or an unusual flow in the lowest stratum from the equator over some other region, possibly on the opposite side of the Antarctic Circle, and this latter would bring about an unusual rain and snow on that side of the antarctic region. As there is a large part of the ocean from which we rarely receive any meteorological information, it is not surprising that we are not yet able to elucidate all the intricacies of the geographic distribution of the areas of excess and deficit of precipitation. Already the Australian drought has been generally succeeded by bountiful rains in many districts and droughty conditions are passing away.

THE RAIN MAKER IN AUSTRALIA.

In connection with the droughts in Australia we have received abundant details of the efforts made to force rain from the unwilling clouds.

At a meeting of the Chamber of Commerce of Broken Hill, Thursday, July 2, the mayor submitted the formula given by Mr. A. J. J. Phelps, of Sydney, and his method was indorsed by several. The formula consists in using sulphuric acid and zinc, the hydrogen set free ascends with aqueous vapor "in spiral columns which are hollow when they reach the rain belt in the atmosphere, and the cold air in that region rushes down to the warmer air below."

Any one can try this simple well-known chemical experiment for making hydrogen, but we have every assurance that no rain will result and no cold air will rush down and no rain belt will be found in the atmosphere. This, in fact, was the experience of Mr. Allen and the Australian committee at Stephens Creek, which reported that "the experiments were not successful, owing to there being rather too much wind to allow the column of gas to ascend perpendicularly."

The failure of Mr. Allen was complete; the excuse was quite unphilosophical and unnecessary.

Previous to Mr. Allen's *fiasco*, a much more imposing attempt had been made by Dr. C. DeLacy McCarthy, who is said to be "a graduate of Trinity College, Dublin, and who spoke with the utmost confidence on the question of the production of rain, saying: 'I will start to work on Wednesday, and you will have rain by Saturday.'"

The Government of South Australia, the Chamber of Commerce, and the water companies of Broken Hill had united in bearing the expense of a special train to bring Dr. McCarthy and five assistants and apparatus from Petersburg. He did not wish the details of his method known except that in general—

He forces chemical fumes into the air for a great distance which create a vacuum in the fourth, fifth, and sixth strata of air. The center of

a heat storm is thus formed and the cold air descends, resulting in a heavy tropical rain. The secret of the chemicals was given him by a man in America. He had improved on the system with the aid of a clever Japanese chemist. He changes his methods to suit varying conditions. It may require thirty-two hours of continuous work to achieve success. He produced rain in twenty-two hours in Victoria.

Dr. McCarthy delayed three days before beginning; meantime the sky clouded over and predictions were received from Mr. Barrachi, Director of the Meteorological Office, at Melbourne, forecasting rain within three days. McCarthy's experiments began on Wednesday, a furious dust storm prevailed with northwest winds; although the wind and dust were distressing, he announced that "the vacuum is working still far up." But the wind veered to the south and all chance of the predicted rain from the west seemed to disappear. Eventually, "on July 3, Dr. McCarthy suspended operations, saying that conditions were all against him." He expected to resume when favorable predictions should be published by the Meteorological Office.

A few days before this Mr. Rutter, with several local chemists, "Had sent up a column of hydrogen which was followed by clouds and light rain, and they felt certain that a heavy downpour would have resulted had they continued their efforts." Probably, they realized that the clouds and light rain really had nothing to do with their hydrogen gas.

In their extremity the Broken Hill people naturally clutched at the flimsiest straws, "listening even to Mr. F. J. Mars, engineer of the local electric light works, who urged that huge kites should be sent up carrying dynamite to be fired by electricity."

We have given much space to this interesting episode in the great Australian drought, as we hope it may prove to be the last occasion on which the rainmakers will attempt to delude the suffering people with their chemicals, their upper vacuum, their dynamite, and their false theories.

The time has not yet come when man may plow the atmosphere for rain as he plows the soil for crops. If mines must be worked and towns built in arid regions, let the promoters of these schemes be required to build aqueducts and bore wells sufficient in advance to supply the needed water, not waiting until droughts come and the people die. Every place on this globe has its rainy years and its dry years. Areas of cold and heat, wind and calm, rain and drought appear and move and disappear in irregular succession. We must prepare for them and provide against disaster. We can not control the weather, but we may control ourselves.

METEOROLOGY IN THE UNIVERSITIES.

We are pleased to learn that the higher problems of meteorology are treated in the course on "Mathematical Physics" at Cornell University. The last catalogue at page 147 has the following item:

Advanced course open to juniors, seniors, and graduates. No. 45, Mathematical theory of fluid motion, including the mechanics of the atmosphere and vortex motion. Assistant Professor James McMahon.

The Department of Geology and Geography at Harvard University offers the following courses in meteorology and climatology during the coming year.

Geology B, 2nd hf.—Meteorology (elementary course): Lectures, written exercises, observations, and laboratory work. Half-course (second half year): Laboratory work (two hours a week). Assistant Professor R. DeC. Ward.

The lectures present the subject under the following headings: The earth's atmosphere: its composition, temperature, pressure, and general circulation. The moisture of the atmosphere: dew, frost, clouds, rainfall. Storms: cyclones, thunderstorms, tornadoes. Weather. Climate.

The laboratory work consists chiefly in the construction and study of weather maps; practice in the use of ordinary meteorological instruments; individual record of observations; weather forecasting, etc.

Geology I, 1st hf.—Meteorology (second course): Lectures, observations, and reports. Half course (first half year). Assistant Professor Ward.